Office of Basic Energy Sciences
Office of Science

CD-2, Approve Performance Baseline for the Center for Functional Nanomaterials (CFN) A Nanoscale Science Research Center at Brookhaven National Laboratory

A. Purpose

The purpose of this paper is to document the review by the Office of Science Energy Systems Acquisition Advisory Board-equivalent for the Critical Decision "Approve Performance Baseline (CD-2)" for the Center for Functional Nanomaterials (CFN), a Nanoscale Science Research Center (NSRC) at Brookhaven National Laboratory (BNL).

B. Mission Need

The Center for Functional Nanomaterials (CFN) will serve as the nucleus of an integrated BNL program in nanoscience. It will facilitate major new directions in BNL's materials and chemical research programs, and greatly expand the capabilities available to a national user base, thereby increasing university and industrial interactions. The Center will enable the Nation to focus efforts in nanoscience and technology via promoting complementary, interdisciplinary work, including the Chemistry Department, the Materials Science Department, Condensed Matter Physics, the Instrumentation Division, the National Synchrotron Light Source Department, and the Biology Department. The Center will also integrate Nanoscale research with existing synchrotron capabilities in a broad range of techniques, including hard and soft x-ray scattering and spectroscopy, with new materials synthesis and nanofabrication capabilities including theory and modeling. The Center will serve as a focal point for collaborations, enabling studies of functional materials at the nanoscale involving academia and private industry. The CFN will be a highly collaborative unique National User facility for nanoscience.

The scientific goal of the CFN is to understand the chemical and physical response of nanomaterials, with the challenge being to attain the level of understanding needed to tailor or design new classes of functional materials. The CFN's programs will exploit the unique electronic and optical properties of nanoparticles and molecular nanoarrays to design chemical systems with specific functionality for diverse, energy-related applications such as catalysis, photo-induced energy conversion and storage, and molecular conductors. Another science emphasis will be to examine the behavior and fundamental properties of functional nanocomposite materials including ferro-electrics, and magnetic and superconducting thin films to provide insights into their future applications. This capability and focus are complementary to the other planned NSRCs; it capitalizes on the National Synchrotron Light Source (NSLS) leadership in new materials probes; and it builds on the strengths of BNL's BES programs in (1)

strongly correlated electron systems, (2) catalysis, (3) molecular materials, (4) electrochemistry, and (5) nanostructure in complex functional materials.

C. Project Performance Scope Baseline

The CFN performance scope baseline consists of the CFN building, and procurement and installation of an initial set of specialized scientific equipment needed to support research activities in Nanoscience. The facility will be a new building of about 94,500 gross square feet (gsf) located across the street from the existing NSLS. The CFN facility will consist of a two-story building housing state-of-the-art clean rooms; wet and dry laboratories for sample preparation, fabrication, and analysis; office space for BNL staff and users; and conference rooms. Elimination of space to offset this new construction will be accomplished by SC-funded demolition of excess facilities at BNL scheduled for FY 2002 through 2006.

D. Project Performance Cost and Schedule Baseline

The performance baseline Total Estimated Cost (TEC) of $79.7 million and performance baseline Total Project Cost (TPC) of $81million are based on receiving the following funding levels (in thousands of dollars):

Fiscal Year	Total Estimated Cost		Other Project Costs	TPC
	Project Engineering & Design	Construction	Conceptual Design, NEPA, Hazard Analysis, Other, and Pre-Operations	Total
Prior			300	300
2003	988			988
2004	2,982			2,982
2005	2,012	18,465		20,477
2006		36,553		36,553
2007		18,700	500	19,200
2008			500	500
	5,982	73,718		
Total	79,700		1,300	81,000

CD-0	Approve Mission Need	June 2002
CD-1	Approve Alternative Selection and Cost Range	July 2003
CD-2	Approve Performance Baseline	May 2004
CD-3	Approve Start of Construction	December 2004
CD-4a	Approve Start of Initial Operations	April 2007
CD-4b	Approve Start of Full Operations	April 2008

E. Preliminary Design, Performance Baseline EIR, and Review of Contractor Project Management System

BNL hired HDR Architecture, Inc. an Architectural/Engineering (A/E) firm from Alexandria, VA, to provide Title I and II engineering design, Title III construction inspection and shop drawing review for the project. Construction will be performed by a fixed-price, construction contractor administered by BNL. The contractor will be selected using a best value process. The equipment will be competitively procured through fixed price contracts. Based on the performance design documentation and cost estimates, Jupiter Corporation conducted the performance baseline EIR/ICE on March 22-26, 2004. An internal Independent Cost Estimate (ICE) was also performed on March 4, 2004 by the CFN project. Jupiter Corporation issued the final report on April 26, 2004. In consultation with the CFN Program Manager in BES, the review findings have been addressed in a Corrective Action Plan (CAP).

F. Environmental Strategy

The CFN will be designed, constructed and operated in compliance with all requirements of the National Environmental Policy Act (NEPA) and its implementing regulations and in accordance with applicable Federal, state and local guidelines for environmental projects. An Environmental Evaluation Notification Form was prepared and has resulted in a Categorical Exclusion (CX) dated October 6, 2003, under NEPA and remains valid.

G. Preliminary Safety Assessment and Hazard Analysis

A Preliminary Hazard Analysis Report (PHA) for the CFN was completed and issued in April, 2003. This included an initial hazard screening for the facility to identify potential hazards associated with the construction and operation of the proposed CFN. The PHA has been updated in January, 2004 prior to the External Independent Review (EIR) of the CFN. The initial Facility Hazard Categorization (FHC) of the CFN has been determined to be a "Radiological Facility". Further analysis of radiation generating devices and the chemical inventory will be conducted as the design progresses and processes become more defined, this further analysis is fully expected to down grade the initial FHC to an "Industrial Facility". The CFN Work Control Process will be used to evaluate and develop controls for the research activities. The Risk Management Plan prepared for CD-1 and issued April 2003 has been updated in May 2004 to include all observations/findings as recommended by the EIR Review Team.

H. Energy Conservation and Sustainable Design

The CFN will be designed to comply with 10CFR435. The project will prepare a compliance analysis report. Sustainable building design principles will be applied to the design and construction of the CFN. Standard practices include using recycled content products, purchasing energy efficient and water efficient material and equipment (Energy Star) and substituting less hazardous construction materials will be used. The project design objective will be to achieve the highest Leadership in Energy and Environmental Design (LEED) rating possible consistent with mission functional requirements and the established project budget.

Submitted by:

Joseph Eng
DOE Federal Project Director
DOE Brookhaven Area Office

May 18, 2004
Date

M. Holland

Michael D. Holland, Manager
DOE Brookhaven Area Office

5/19/04
Date

Kristin Bennett, Program Manager
Office of Basic Energy Sciences
Office of Science

5/21/04
Date

Recommendations

The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of CD-2, Performance Baseline, for the Center for Functional Nanomaterials at BNL as noted below.

5/21/04 — Yes ✓ No ___
ESAAB Secretariat, Construction Mgmt Support Division — Date

Yes — No ___
Representative, Non-Proponent SC Program Office — Date

5-21-04 — Yes ✓ No ___
Representative, Financial Mgmt. Division — Date

5-21-04 — Yes ✓ No ___
Representative, Environmental, Safety and Health Division — Date

5/21/04 — Yes ✓ No ___
Representative, Security Mgmt. Team — Date

5/21/04 — Yes ___ No ___
Representative, Laboratory Infrastructure Division — Date

Yes ___ No ___
Representative, Grants and Contracts Division — Date

Approval

Based on the material presented above and at this review, Critical Decision-2, Performance Baseline, is approved. Therefore, the Brookhaven Area Office is authorized to continue with expenditure of Project Engineering & Design funds for the Title II design of the Center for Functional Nanomaterials, a Nanoscale Science Research Center.

Patricia M. Dehmer — 4/21/2004 (Date)
Associate Director of the Office of Science
Director, Office of Basic Energy Sciences
Office of Science